

Application No. 10/053,699

AMENDMENTS TO THE CLAIMS:

1. (Currently Amended) A method for transmitting optical signals through free space, comprising:
providing a transmit aperture;
determining an inner scale in an atmosphere near the transmit aperture; and
emitting a single broad, divergent and collimated beam comprising a plurality of optical wavelengths, each optical wavelength generated by a laser and comprising a modulated communication, wherein the beam has a diameter at the transmit aperture that is less than an the determined inner scale near the transmit aperture and within the Rayleigh range, and wherein a divergence angle of the beam is selected so that it exceeds a determined turbulence induced beam deviation at a predetermined distance to a receiver.
2. (Previously Presented) A method, as claimed in Claim 1, wherein the air current is at or near the transmit aperture and wherein the beam diameter is about 1 to 10mm.
3. (Original) A method, as claimed in Claim 1, wherein the beam has an angle of divergence of from about 50 to about 2,000 μ r.
4. (Original) A method, as claimed in Claim 1, wherein an optical receiver is positioned relative to the beam such that the receive aperture of the optical receiver subtends at least about 50 microradians of the beam.
5. (Original) A method, as claimed in Claim 1, wherein the beam has a diameter that is less than an inner scale of the air turbulence.
6. (Original) A method, as claimed in Claim 1, wherein the beam has a diameter that is from about 5 to about 20% of a distance to a heat emitting surface adjacent to the transmit aperture.

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7. (Canceled)

8. (Currently Amended) A method, as claimed in Claim 1, wherein an optical receiver is positioned relative to the beam such that the receive aperture of the optical receiver subtends at least about 20 microradians microradians of the beam.

9. (Original) A method, as claimed in Claim 1, further comprising:
receiving the beam at a receiver; and
focusing a plurality of optical wavelengths at a corresponding plurality of spatially discrete locations, a respective optical detector being positioned at or near each location.

10. (Original) A method, as claimed in Claim 9, further comprising:
passing a first optical wavelength through a first immersion lens to form further focused first radiation; and
receiving the further focused first radiation with a first optical detector.

11. (Previously Presented) An optical transmission apparatus, comprising:
a radiation source comprising a laser for emitting a collimated beam of radiation through free space, the beam comprising a plurality of optical wavelengths, each optical wavelength corresponding to a different communication channel;
a modulator in communication with the radiation source for modulating the beam with information;
a transmit aperture, wherein the transmit aperture has a size sufficient to output a maximum beam diameter that is less than an a determined inner scale of an air current at or near the transmit aperture, and wherein the beam of radiation has a divergence angle that exceeds a determined turbulence induced beam deviation at a receiver.

12. (Canceled)

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13. (Original) An apparatus, as claimed in Claim 11, wherein the transmit aperture outputs a collimated beam of radiation.

14. (Previously Presented) An apparatus, as claimed in Claim 11, wherein the air current is at or near the transmit aperture and wherein the beam diameter ranges from about 2 to about 10 mm.

15. (Original) An apparatus, as claimed in Claim 11, wherein the beam has an angle of divergence of from about 20 to about 2,000 μ r.

16. (Original) An apparatus, as claimed in Claim 11, wherein an optical receiver is positioned relative to the beam such that the receive aperture of the optical receiver subtends at least about 50 microradians of the beam.

17. (Original) An apparatus, as claimed in Claim 11, wherein the beam has a diameter that is less than an inner scale of the air turbulence.

18. (Previously Presented) An apparatus, as claimed in Claim 11, wherein the beam has a diameter that is from about 5 to about 20% of a distance to an adjacent heat emitting surface and wherein the beam diameter ranges from about 1 to 10mm.

19. (Canceled)

20. (Canceled)

21. (Original) An apparatus, as claimed in Claim 11, further comprising: an optical receiver operable to receive the beam, the optical receiver comprising a plurality of optical detectors and a diffractive optical element operable to focus a plurality of

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optical wavelengths at a corresponding plurality of spatially discrete locations, wherein a respective optical detector is positioned at or near each location to detect the corresponding focused optical wavelength.

22. (Original) An apparatus, as claimed in Claim 21, wherein the optical receiver further comprises at least a first immersion lens operable to focus first radiation of a first wavelength to form further focused first radiation, wherein the further focused first radiation is thereafter received by a respective first optical detector.

23. (Currently Amended) An optical transmission apparatus, comprising:
a laser radiation source;
a modulator in communication with the radiation source for modulating a beam output by the radiation source with information, the beam comprising a plurality of optical wavelengths, each optical wavelength corresponding to a different communication channel and;
a transmit aperture, wherein the transmit aperture causes the beam to be divergent, wherein a divergence angle of the single beam is at least about 20 μ rad, and wherein the diameter of the single beam at the transmit aperture is less than an inner scale of an air current at or near the transmit aperture.

24. (Canceled)

25. (Canceled)

26. (Original) An apparatus, as claimed in Claim 23, wherein the beam of radiation has an angle of divergence ranging from about 50 μ r to about 2000 μ r.

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27. (Previously Presented) An apparatus, as claimed in Claim 24, wherein the air current is at or near the transmit aperture and wherein the beam diameter ranges from about 2 to 10mm.

28. (Original) An apparatus, as claimed in Claim 23, wherein the beam has an angle of divergence of from about 20 to about 2,000 μ r.

29. (Original) An apparatus, as claimed in Claim 23, wherein an optical receiver is positioned relative to the beam such that the receive aperture of the optical receiver subtends at least about 50 microradians of the beam.

30. (Original) An apparatus, as claimed in Claim 24, wherein the beam has a diameter that is less than an inner scale of the turbulence.

31. (Previously Presented) An apparatus, as claimed in Claim 24, wherein the beam has a diameter that is from about 5 to about 20% of a distance to a heat emitting surface adjacent to the aperture and wherein the beam diameter ranges from about 1 to 10mm.

32. (Canceled)

33. (Original) An apparatus, as claimed in Claim 23, wherein an optical receiver is positioned relative to the beam such that the receive aperture of the optical receiver subtends at least about 20 microradians of the beam.

34. (Original) An apparatus, as claimed in Claim 23, further comprising:
an optical receiver operable to receive the beam, the optical receiver comprising a plurality of optical detectors and a diffractive optical element operable to focus a plurality of optical wavelengths at a corresponding plurality of spatially discrete locations, wherein a

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respective optical detector is positioned at or near each location to detect the corresponding focused optical wavelength.

35. (Original) An apparatus, as claimed in Claim 34, wherein the optical receiver further comprises at least a first immersion lens operable to focus first radiation onto a smaller detector than what could be achieved in air.

36. (Currently Amended) A method for designing an optical transmitter, comprising:
providing an optical transmitter capable of emitting a laser beam;
determining an inner scale at a proposed location for a transmit aperture; and
determining a worst case atmospheric induced deviation for the laser beam;
selecting a transmit aperture size sufficient to output a maximum beam diameter that is less than the inner scale, wherein said beam comprises a plurality of optical wavelengths, each optical wavelength corresponding to a different communication channel;
selecting an optical wavelength, wherein said selected wavelength and said beam diameter resulted in an angle of divergence for the laser beam that is greater than about 50 mrad.

37. (Original) An apparatus, as claimed in Claim 36, further comprising:
selecting the transmit aperture to produce a collimated beam.

38. (Original) An apparatus, as claimed in Claim 37, wherein the angle of divergence of the beam ranges from about 0.1 mrad to about 2.0 mrad.

39. (Original) A method, as claimed in Claim 36, wherein the beam has a diameter that is less than a Fresnel length of the air current.

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40. (Previously Presented) A method, as claimed in Claim 36, wherein the beam has a diameter that is from about 5 to about 20% of a distance to a heat emitting surface adjacent to the transmit aperture.

41. (Canceled)

42. (Original) A method, as claimed in Claim 36, wherein an optical receiver is positioned relative to the beam such that the receive aperture of the optical receiver subtends at least about 20 microradians.

43. (Currently Amended) A method, as claimed in Claim 8, wherein the distance between said transmitter and said receiver is greater than 100m a long distance.

44. (Currently Amended) An apparatus, as claimed in Claim 9, wherein the distance between said transmitter and said receiver is greater than 1000m a long distance.

45. (Previously Presented) An apparatus, as claimed in Claim 16, wherein the distance between said transmitter and said receiver is a long distance.

46. (Previously Presented) An apparatus, as claimed in Claim 21, wherein the distance between said transmitter and said receiver is a long distance.

47. (Previously Presented) An apparatus, as claimed in Claim 33, wherein the distance between said transmitter and said receiver is a long distance.

48. (Previously Presented) An apparatus, as claimed in Claim 34, wherein the distance between said transmitter and said receiver is a long distance.

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49. (Previously Presented) An apparatus, as claimed in Claim 42, wherein the distance between said transmitter and said receiver is a long distance.